AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all previous versions, and listings, of claims in this application.

Listing of Claims

1. (Currently amended) A method of using a computer to derive and optimize a mathematical model for a system comprising:

a) providing a plurality of unit operations stored in ~~said~~ a computer that each mathematically represent ~~all or a subset of all~~ one or more physical, chemical, or biological actions that can be ~~done~~ performed on one or more ~~on a set of~~ ~~system~~ components of ~~said~~ a system~~, wherein said unit operation is mathematical representation of a physical, chemical or biological process, or kinetic expression~~;

b) providing a first hypothetical mathematical model comprising a subset of said unit operations;

c) applying a first artificial intelligence (AI) algorithm to said first hypothetical mathematical model to produce at least one second hypothetical mathematical model;

d) using a fitness function to determine which of said first and second hypothetical models best represents the system; and[[;]]

e) communicating to a user one of said first or second hypothetical ~~model~~ models that best represents the system ~~to a user in a tangible form~~.

2. (Currently amended) The method according to claim 1 wherein said fitness function comprises one or more of:

i) goodness of fit comparison with at least a first set of empirical data observed for the system;

ii) ~~a feasibility test against theoretical constraints~~ rules of thermodynamic principles; and

iii) ~~a feasibility test against theoretical constraints of physical laws~~ a test for violation of physical and chemical laws.

3. (Previously presented) The method according to claim 2 wherein said fitness function comprises at least one weighting factor to adjust at least a first adjustable parameter of said data.

4 (Previously presented) The method according to claim 1 or 2 wherein said method further comprises iterating steps c) and d) to obtain alternative models that describe the system and to generate a global optimum solution comprising said first or second hypothetical mathematical model that best represents the system.

5. (Previously presented) The method according to claims 1 or 2 wherein said AI algorithm is a genetic algorithm.

6. (Previously presented) The method according to claims 1 or 2 wherein said fitness function is a direct comparison to a first set of empirical data.

7. (Previously presented) The method according to claim 6 wherein said first set comprises a set of differential display data points.

8. (Previously presented) The method according to claim 7 wherein said differential data points comprise differential gene expression data points.

9. (Previously presented) The method according to claim 8 wherein said differential gene expression data points are generated from cancerous tissue compared to normal tissue.

10. (Previously presented) The method according to claim 9 wherein said cancerous tissue is selected from the group of cancerous tissues consisting of breast, prostate, lung, brain, ovarian, pancreas, liver, kidney, bladder and heart.

11. (Previously presented) The method according to claim 7 wherein said differential display data points comprise differential weather pattern points.

12. (Previously presented) The method according to claim 7 wherein said differential display data points comprise differential traffic pattern data points.

13. (Previously presented) The method according to claim 7 wherein said differential display data points comprise differential financial market data points.

14. (Withdrawn) The method to generate a mathematical model of a biological system comprising:

a) providing a plurality of first order pseudogene unit operations that define a set of biochemical system parameters;

b) generating a first set of first order pseudochromosomes from said pseudogenes;

b) applying a genetic algorithm with a fitness function to said set of first order pseudochromosomes to produce a second set of second order pseudochromosomes;

c) comparing said second set of second order pseudochromosomes to at least a first set of empirical data;

d) optionally reiterating steps b) and c) to generate a global optimum solution comprising said mathematical model.

15. (Withdrawn) The method according to claim 14 wherein said first set of empirical data comprises a set of differential data points.

16. (Withdrawn) The method according to claim 15 wherein said differential data points comprise differential gene expression data points.

17. (Withdrawn) The method according to claim 15 wherein said differential gene expression data points are generated from cancerous tissue compared to normal tissue.

18. (Withdrawn) A method to derive and optimize a mathematical model for a system comprising:

a) providing a plurality of unit operations that define a set of system parameters;

b) providing a first hypothetical mathematical model comprising a subset of said unit operations;

c) applying a first artificial intelligence (AI) algorithm to said plurality to produce a second hypothetical mathematical model;

c) comparing said second hypothetical model to at least a first set of empirical data to define at least a first difference between said first hypothetical model and said data;

d) altering said first algorithm to adjust for said first difference to generate a second AI algorithm;

e) applying said second AI algorithm to said second hypothetical model to produce a third hypothetical model; and

f) comparing said third hypothetical model to said first set of data.

19. (Previously presented) A computer for deriving and optimizing ~~readable medium to direct a computer to function in a specified manner to derive and optimize~~ a mathematical model for a system comprising:

a central processing unit; and

a memory that communicates with the central processing unit, the memory comprising:

a) a unit operations module to:

receive and store unit operations each mathematically representing one or more physical, chemical, or biological actions that can be performed on one or more components of a system, and

generate at least a first hypothetical mathematical model of said system, said model comprising a subset of said unit operations~~, wherein said unit operation is mathematical representation of a physical, chemical or biological process, or kinetic expression~~;

b) an analysis module to apply an artificial intelligence algorithm to said first hypothetical model to produce a second hypothetical model; ~~and~~

c) a comparison module to compare said first and second hypothetical models to at least a first set of empirical data, and select the hypothetical model that best represents the empirical data; and

d) a communication module to a user the hypothetical model that best represents the empirical data.

~~wherein said memory communicates with a central processing unit of said computer.~~

20. (Previously presented) The method according to claim 1, wherein said system is a biological system.

21. (Previously presented) The method according to claim 1, wherein said system is a biochemical system.

22. (Previously presented) The method according to claim 1, wherein said system is a physiological system.

23. (Previously presented) The method according to claim 1, wherein said system is a weather system.

24. (Previously presented) The method according to claim 1, wherein said system is a financial system.

25. (Previously presented) The method according to claim 1, wherein said system is an economic system.

26. (Previously presented) The method according to claim 1, wherein said first mathematical model comprises differential equations.

27. (Previously presented) The method according to claim 1, wherein said first mathematical model comprises difference equations.

28. (Previously presented) The method according to claim 1, wherein said first mathematical model comprises Laplace transforms of difference and/or differential equations.

29. (Previously presented) The method according to claim 2 wherein said first set of empirical data comprises a set of differential display data points.

30. (Cancelled)

31. (Previously presented) The method according to claim 29, wherein said differential display data points comprise differential gene expression data points.

32. (Previously presented) The method according to claim 29, wherein said differential display data points comprise differential protein expression data points.

33. (Previously presented) The method according to claim 32, wherein said differential protein expression data points are obtained from stable isotope mass spectrometric tagging experiments.

34 (Previously presented) The method according to claim 32, wherein said differential protein expression data points are obtained from antibody microarray experiments.

35. (Currently amended) The method according to claim 29 ~~30~~, wherein said differential display data points comprise differential metabolite expression or metabolic flux data.

36. (Currently amended) The method according to claim 29 ~~30~~, wherein said differential display points are generated from cancerous tissue compared to normal tissue.

37. (Previously presented) The method according to claim 36 wherein said cancerous tissue is selected from the group of cancerous tissues consisting of breast, prostate, lung, brain, ovarian, pancreas, liver, kidney, bladder and heart.